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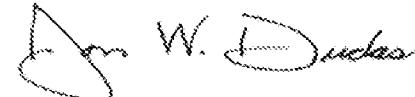
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**PROVISIONAL APPLICATION FOR PATENT COVER SHEET**

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

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60/554214

031804

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22264  
60/554214 Additional inventors are being named on the \_\_\_\_\_ separately numbered sheets attached hereto**TITLE OF THE INVENTION (500 characters max)****FABRICATED VEHICLE WHEEL AND METHOD FOR PRODUCING SAME**

Direct all correspondence to:

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**ENCLOSED APPLICATION PARTS (check all that apply)** Specification Number of Pages**\*11** CD(s), Number Drawing(s) Number of Sheets**3**

Other (specify)

**\* Patent Nos. 5,188,429, 5,360,261,  
and 5,533,261 also part of spec.** Application Data Sheet. See 37 CFR 1.76**METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT** Applicant claims small entity status. See 37 CFR 1.27.

FILING FEE

 A check or money order is enclosed to cover the filing fees

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 The Director is hereby authorized to charge filing  
fees or credit any overpayment to Deposit Account Number**08-1393** Payment by credit card. Form PTO-2038 is attached.**\$160.00**The invention was made by an agency of the United States Government or under a contract with an agency of the  
United States Government. No. Yes, the name of the U.S. Government agency and the Government contract number are: \_\_\_\_\_

Respectfully submitted,

Date **03/18/04**

SIGNATURE \_\_\_\_\_

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(if appropriate)

TELEPHONE **(419) 255-5900**Docket Number: **1-24998****USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT**

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Applicant(s): Patrick McCorry et al.

Docket No.

1-24998

Serial No.

Filing Date

Examiner

Group Art Unit

Invention: **FABRICATED VEHICLE WHEEL AND METHOD FOR PRODUCING SAME**

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TITLE

FABRICATED VEHICLE WHEEL AND  
METHOD FOR PRODUCING SAME

5

BACKGROUND OF THE INVENTION

This invention relates in general to vehicle wheels and in particular to an improved fabricated vehicle wheel.

A conventional fabricated vehicle wheel is typically of a two-piece construction and includes an inner disc and an outer “full” rim. The disc can be cast, forged, or fabricated from steel, aluminum, or other alloys, and includes an inner annular wheel mounting portion and an outer annular portion. The wheel mounting portion defines an inboard mounting surface and includes a center pilot or hub hole, and a plurality of lug receiving holes formed therethrough for mounting the wheel to an axle of the vehicle. The rim is fabricated from steel, aluminum, or other alloys, and includes an inboard tire bead seat retaining flange, an inboard tire bead seat, an axially extending well, an outboard tire bead seat, and an outboard tire bead seat retaining flange. In some instances, a three-piece wheel construction having a mounting cup secured to the disc is used. In both types of constructions, the outer annular portion of the disc is typically secured to the rim by welding.

SUMMARY OF THE INVENTION

This invention relates to a fabricated vehicle wheel and method for producing the same. The fabricated vehicle wheel includes a wheel rim and a wheel disc secured to the wheel rim. The wheel disc includes a generally centrally located wheel mounting surface, a plurality of outwardly extending spokes, and a plurality of windows formed therein between each pair of spokes.

According to the present invention, the windows are formed by two separate window piercing operations. The method for producing the fabricated vehicle wheel of the present invention includes the steps of: (a) providing a wheel rim; (b) providing a wheel disc having a final formed profile, the wheel disc including a generally centrally located wheel mounting surface and a plurality of outwardly extending spokes; (c) subjecting the wheel disc to a first window piercing operation to produce one of an outer portion and an inner portion of a window in the wheel disc between each pair of spokes; (d) subsequent to step (c), subjecting the wheel disc to a second window piercing operation to produce the other one of the outer portion and the inner portion of the window in the wheel disc; (e) securing the wheel disc and the wheel rim together to produce the fabricated vehicle wheel.

Other advantages of this invention will become apparent to those skilled in the art from the following detailed description of the preferred embodiments, when read in light of the accompanying drawings.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view of a wheel disc according to the present invention adapted for use in producing a fabricated vehicle wheel.

Fig. 2 is a front plan view of the wheel disc illustrated in Fig. 1.

Fig. 3 is a sectional view of the wheel disc taken along line 3-3 of Fig. 2.

Fig. 4 is a sectional view of the wheel disc taken along line 4-4 of Fig. 2.

Fig. 5 is a view of a portion of the wheel disc taken in the direction of arrow X of Fig. 1.

Fig. 6 is a view of a portion of the wheel disc taken in the direction of arrow Z of Fig. 1.

Fig. 7 is a block diagram illustrating a sequence of steps for producing the wheel disc in accordance with the present invention.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, there is illustrated in Figs. 1-3 an inner wheel disc, indicated generally at 10, produced in accordance with the present invention. The wheel disc 10 produced according to this invention is illustrated as being adapted for use with a fabricated "well attached" or "drop center" vehicle wheel, such as shown in Fig. 3 of U.S. Patent No. 5,188,429 to Heck et al. and Fig. 3 of U.S. Patent No. 5,533,261 to Kemmerer, the disclosures of each of these patents incorporated herein by reference and a copy of each of these 5 patents attached herewith. Although the present invention is illustrated and described in conjunction with the particular vehicle wheel constructions disclosed herein, it will be appreciated that the invention can be used in conjunction with other types of vehicle wheel constructions. For example, the vehicle wheel can be a "bead seat attached" vehicle wheel, such as shown in Fig. 10 4 of U.S. Patent No. 5,188,429 to Heck et al. Also, depending upon the particular styling of the associated vehicle wheel, the wheel disc 10 of the present invention can possibly be used in conjunction with a "modular wheel" construction including a partial rim and a full face wheel disc, such as shown in U.S. Patent No. 5,360,261 to Archibald et al., or a "full face" vehicle wheel, such 15 15 as shown in Fig. 5A of U.S. Patent No. 5,533,261 to Kemmerer, all of these 20 20 patents incorporated herein by reference and a copy of all of these patents enclosed herewith.

As shown in Figs. 1-3, the wheel disc 10 preferably fabricated or otherwise formed from a suitable material, such as for example, steel. The wheel 25 disc 10 includes a generally centrally located wheel mounting surface or portion 12 and a plurality of outwardly extending spokes 14. In the illustrated embodiment, the wheel disc 10 includes five of such spokes 14 which are shown as being formed integral with the wheel mounting surface 12. Alternatively, the

number and/or the construction of the spokes 14 can be other than illustrated if so desired. For example, the wheel disc 10 can include less than five spokes 14 or more than five spokes 14 and/or the spokes 14 can be formed separate from the wheel mounting surface 12 of the wheel disc 10 and joined thereto by a  
5 suitable method.

The wheel mounting surface 12 is provided with a centrally located pilot aperture 16 and a plurality of lug bolt receiving holes 18 circumferentially spaced around the pilot aperture 16. In the illustrated embodiment, the wheel mounting surface 12 includes five of such lug bolt receiving holes 18 which are  
10 preferably provided in the wheel mounting surface 12 "in line" with a respective one of each of the spokes 14. Alternatively, the number and/or the location of the lug bolt receiving holes 18 can be other than illustrated if so desired. The lug bolt receiving holes 18 receive lug bolts (not shown) and nuts (not shown) for securing the wheel disc 10, and therefore the vehicle wheel 10, on an axle (not  
15 shown) of a vehicle.

The mounting surface 12 further includes a plurality of "strengthening" ribs 20 provided therein. In the illustrated embodiment, a rib 20 is located between each pair of lug bolt receiving holes 18. In the illustrated embodiment, each of the ribs 20 is defined by a raised or embossed area which extends  
20 outwardly from or above the mounting surface 12. The ribs 20 are operative to strengthen the mounting surface 12 to keep it from flexing during vehicle operation thereby improving the fatigue life of the associated vehicle wheel. Alternatively, the spacing, location, number and/or configuration of the ribs 20 can be other than illustrated and described if so desired.

25 Each of the spokes 14 has a generally double-Z-shaped cross-section as shown in Fig. 4 and includes a generally flat rear or back wall 30, a pair of opposed side walls 32 and 34 extending outwardly from the rear wall 30, and a pair of front walls 36 and 38 extending a respective one of the side walls 32 and

34. In the illustrated embodiment, the rear wall 30 and the front walls 36 and 38 extend generally parallel to one another. Alternatively, the structure, profile, shape and number of one or more of the spokes 14 can be other than illustrated if so desired. Also, one or more of the spokes 14 can include one or more openings 5 formed therein, such as illustrated by an opening 40 shown in phantom in of the spokes 14 in Fig. 2.

The wheel disc 10 further includes a plurality of windows 50 formed therein between each pair of spokes 14 and preferably as illustrated, a continuous outer ring or band 54. As will be discussed below, the windows 50 are formed 10 by a piercing process in accordance with the method of the present invention through two planes of the associated wheel disc 10. The first plane being generally parallel with respect to an axis A of the wheel disc 10 and illustrated by arrow X in Fig. 3. The second plane being generally non-parallel with respect to the axis A of the wheel disc 10 and illustrated by arrow Z in Fig. 3. In the 15 illustrated embodiment, each of the windows 50 is identical to one another and has a generally triangular like shape with a pair of overlapping or clearance openings or zones 52. Alternatively, the shape of one or more of the windows 50 can be other than illustrated if so desired.

The outer ring 54 is joined to the outer end of each of the spokes 14 and is 20 adapted to be used to join the wheel disc 10 to an associated wheel rim (not shown) to produce the vehicle wheel. The wheel disc 10 can be joined to the wheel rim by any suitable method, such as for example, by welding or riveting. Alternatively, the outer ring 54 can be other than illustrated if so desired. For example, the outer ring 54 can be non-continuous, i.e., can include a separate, 25 individual section(s) provided at an outer end of each of the spokes 14 or can be eliminated and the outer end of each of the spokes 14 can be directly connected to the wheel rim.

Referring now to Fig. 7, there is illustrated a block diagram showing a sequence of steps for producing the wheel disc 10 of the present invention, as illustrated in Figs. 1-3. Initially, in step 60, a preformed fabricated wheel disc having a final contour or shape is subjected to a first window piercing operation 5 to produce a portion of the window in the wheel disc. In the illustrated embodiment and according to one method of forming the windows 50, during step 60 a first or “outer” window portion 70 is formed in the wheel disc during a first pierce operation as shown in Fig. 5. As shown therein, the first window portion 70 includes a pair of cut-outs or openings 70A formed at the associated remote ends thereof. The openings 70A define a break or departure from the rest of a profile 70B of the first window portion 70 for a purpose to be discussed below. In the illustrated embodiment, the openings 70 are generally in the shape of a semi-circle.

Next, in step 62, a second or “inner” window portion 72 is formed in the 15 wheel disc 10 during a second pierce operation as shown in Fig. 6. As shown therein, the second window portion 72 includes a pair of openings 72A formed at the associated remote ends thereof. In the illustrated embodiment, the shape of the openings 72A is the same as the shape of the openings 70A formed during the first piercing operation. The openings 72A define a break or departure from a profile 72B of the second window portion 72 for a purpose to be discussed below. Alternatively, the shape of one or both of the openings 70A and 72A can be other than illustrated if so desired. For example, the openings 70A and 72A could be oval-shaped (not shown) if so desired. Also, the order of forming the first window portion 70 and the second window portion 72 in the wheel disc 10 20 can be reversed if so desired. In other words, the inner window portion 72 can be formed first followed by forming the outer window portion 70. Also, it is preferred that the disc with final contour provided prior to step 60 is fully finish formed except for the windows 50. However, the disc provided prior to step 60 25

can be non fully finished if so desired. For example, following step 62, additional finishing operations, such as piercing the lug bolt holes 18 and the center pilot hole 16, can be performed.

One advantage of the present invention is that the two separate window 5 piercing operations (steps 60 and 62), allows the forming of a relatively large window 50 in the wheel disc 10 through more than one plane (arrows X and Z). Also, the pairs of openings 70A and 72A formed during the two separate window piercing operations is operative to define or provide the clearance or overlapping zones 52. The clearance zones 52 eliminate the concern of 10 positioning the two separate window piercing operations exactly. In other words, without the clearance zones 52, it would be difficult to precisely line up or align the profiles 70B and 72B of the respective window portions 70 and 72 with one another which are formed during the two separate piercing operations. The clearance zones 52 also reduce or eliminate the possibility of a rough edge due to 15 non exact alignment of the two separate window piercing operations.

Additionally, the exact shape of the clearance zones 52 can be preselected and thereby incorporated into the final shape of the windows 50 of the wheel disc 10.

In accordance with the provisions of the patent statutes, the principle and mode of operation of this invention have been described and illustrated in its 20 preferred embodiments. However, it must be understood that the invention may be practiced otherwise than as specifically explained and illustrated without departing from the scope or spirit of the attached claims.

WHAT IS CLAIMED IS:

1. A fabricated vehicle wheel comprising:  
a wheel rim; and  
5 a wheel disc secured to said wheel rim, said wheel disc including a generally centrally located wheel mounting surface, a plurality of outwardly extending spokes, and a plurality of windows formed therein between each pair of spokes;  
wherein said windows are formed by two separate window piercing  
10 operations.
2. The fabricated vehicle wheel according to Claim 1 wherein said wheel disc further includes a continuous outer ring joined to an outer end of each of said spokes.  
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3. The fabricated vehicle wheel according to Claim 1 wherein each of said windows includes at least one clearance zone to thereby eliminate the concern of positioning the two separate window piercing operations exactly.
- 20 4. The fabricated vehicle wheel according to Claim 1 wherein each of said windows includes two clearance zones.
5. The fabricated vehicle wheel according to Claim 1 wherein said wheel disc is formed as an integral, one piece stamping formed from steel.  
25
6. The fabricated vehicle wheel according to Claim 1 wherein said window is formed through two planes of said wheel disc.

7. A method for producing a fabricated vehicle wheel comprising the steps of:

- (a) providing a wheel rim;
- (b) providing a wheel disc having a final formed profile, the wheel disc including a generally centrally located wheel mounting surface and a plurality of outwardly extending spokes;
- 5 (c) subjecting the wheel disc to a first window piercing operation to produce one of an outer portion and an inner portion of a window in the wheel disc between each pair of spokes;
- 10 (d) subsequent to step (c), subjecting the wheel disc to a second window piercing operation to produce the other one of the outer portion and the inner portion of the window in the wheel disc;
- (e) securing the wheel disc and the wheel rim together to produce the fabricated vehicle wheel.

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8. The method for producing a fabricated vehicle wheel according to Claim 7 wherein said wheel disc further includes a continuous outer ring joined to an outer end of each of the spokes.

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9. The method for producing a fabricated vehicle wheel according to Claim 7 wherein during each of steps (c) and (d) at least one clearance zone is formed in the inner portion and the outer portion of the window to thereby eliminate the concern of positioning the two separate window piercing operations exactly.

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10. The method for producing a fabricated vehicle wheel according to Claim 7 wherein during each of steps (c) and (d) two clearance zone is formed in the inner portion and the outer portion of the window to thereby eliminate the concern of positioning the two separate window piercing operations exactly.

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11. The method for producing a fabricated vehicle wheel according to Claim 7 wherein the wheel disc is formed as an integral, one piece stamping formed from steel.

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12. The method for producing a fabricated vehicle wheel according to Claim 7 wherein each of the windows is formed through two planes of the wheel disc.

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### ABSTRACT OF THE WHEEL DISCLOSURE

This invention relates to a fabricated vehicle wheel and method for producing the same. The fabricated vehicle wheel includes a wheel rim and a wheel disc secured to the wheel rim. The wheel disc includes a generally centrally located wheel mounting surface, a plurality of outwardly extending spokes, and a plurality of windows formed therein between each pair of spokes.

5 According to the present invention, the windows are formed by two separate window piercing operations. The method for producing the fabricated vehicle wheel of the present invention includes the steps of: (a) providing a wheel rim;

10 (b) providing a wheel disc having a final formed profile, the wheel disc including a generally centrally located wheel mounting surface and a plurality of outwardly extending spokes; (c) subjecting the wheel disc to a first window piercing operation to produce one of an outer portion and an inner portion of a window in the wheel disc between each pair of spokes; (d) subsequent to step (c), subjecting

15 the wheel disc to a second window piercing operation to produce the other one of the outer portion and the inner portion of the window in the wheel disc; (e) securing the wheel disc and the wheel rim together to produce the fabricated vehicle wheel.

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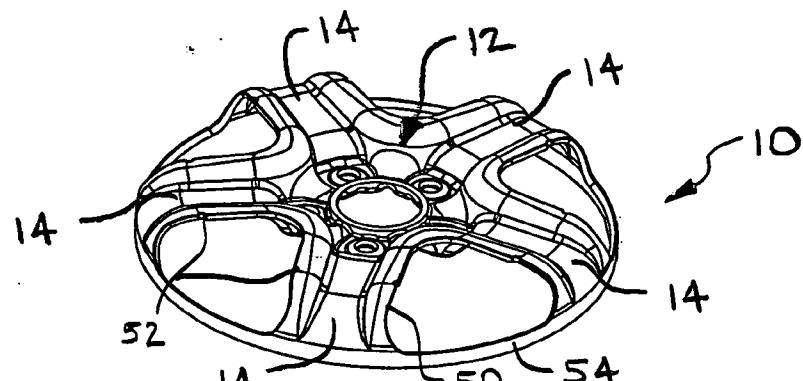


FIG. 1

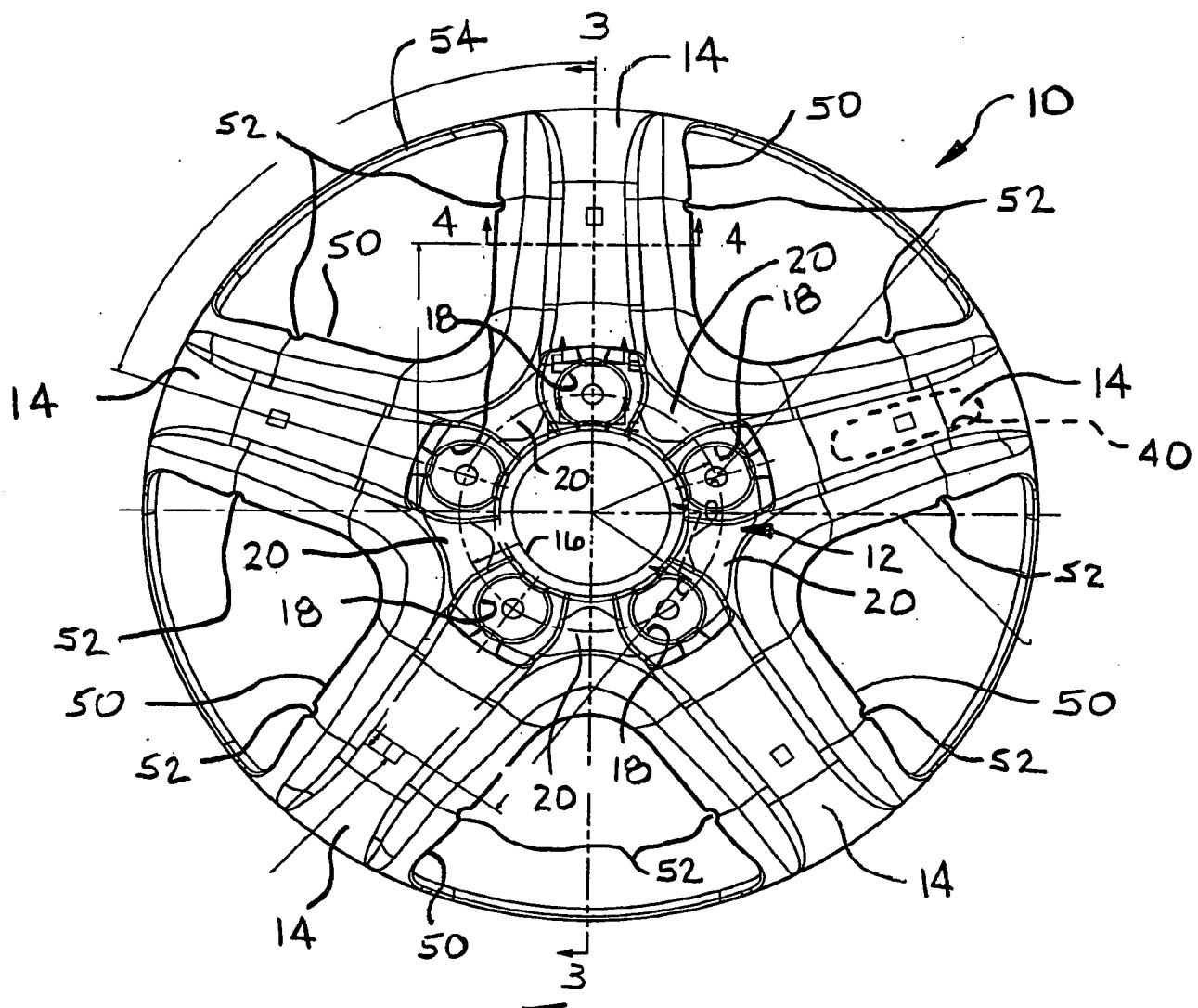


FIG. 2

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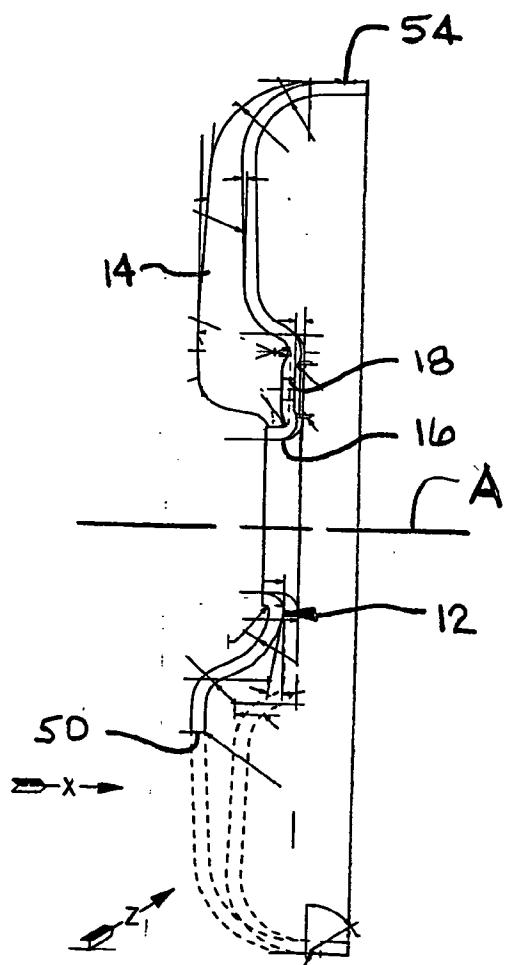


FIG. 3

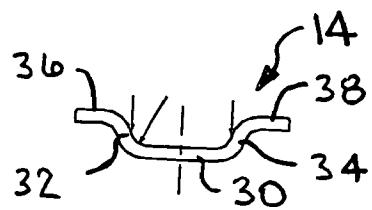


FIG. 4

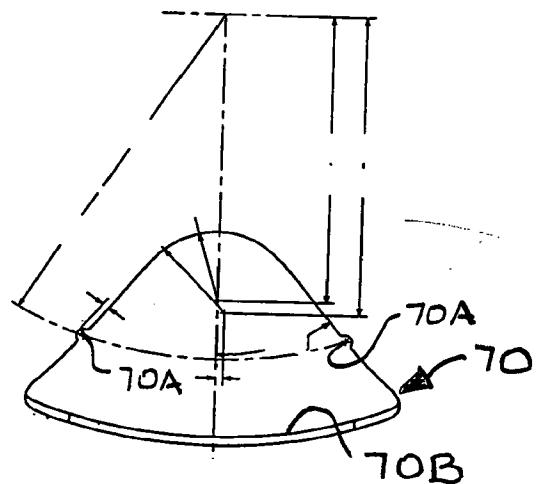


FIG. 5

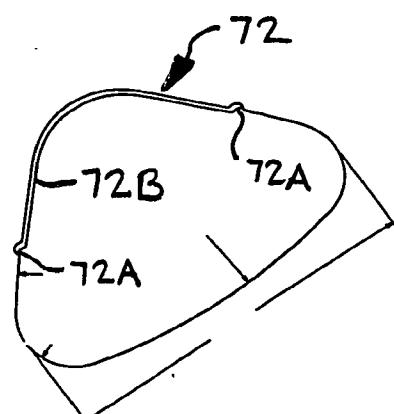
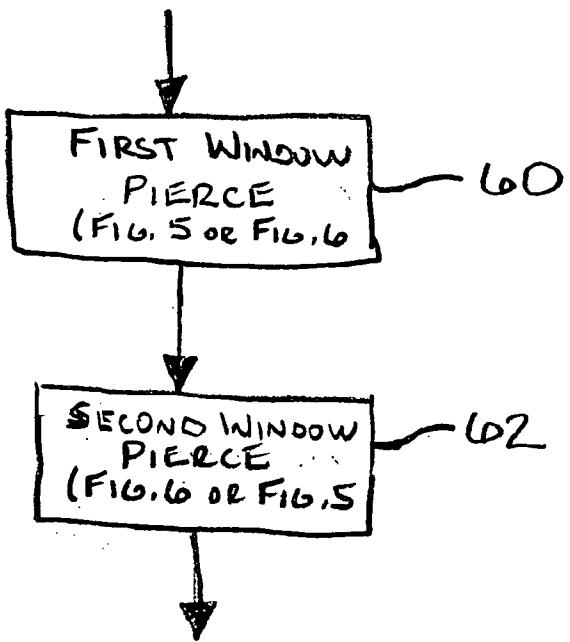


FIG. 6

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DISC WITH  
FINAL CONTOUR



DISC WITH FINAL  
CONTOUR AND  
PIERCED WINDOWS  
(FIGS. 1-3)

FIG. 7